76. Some Aspects of the Nutritive Value of the Dromedary Camel (*Camelus dromedarius*) Meat

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Introduction

Sudan has the second place largest population of camels in the world after Somalia with 4.5 millions heads of camels and with camel meat production of 49,880 tons (FAOStat, 2009). Recently, the local consumption of camel meat had increased especially from young camels due to tender meat. The demand for camel meat appears to increase due to reasons related to human health. They produce meat with relatively less fat than other animals (Dawood and Alkanhal, 1995, Kurtu, 2004; Kadim *et al*., 2008). Meat from young camels has been reported to be comparable in taste and texture to beef (Elgasim & Alkanhal, 1992, Kadim *et al*., 2008). Fatty acid profile of camel meat was found to be comparable to other camelids like llama (Polidori *et al*., 2007). Similarly, amino acids were similar to those reported for bovine, lamb and goat meat (Dawood and Alkanhal, 1995; Elgasim and Alkanhal, 1992). The present study aimed to address some aspects of nutritive value in meat from Sudanese male and female desert camels (*Camelus dromedarius).*

Materials and Methods

Longissimus dorsi (LD), muscle was removed between the 1st to the 5th lumbar vertebrate from the right carcass side of 14, two to three year old camels (7 males and 7 females). Connective tissues and visible fat were removed muscles were placed in plastic bags and kept for 24 h at 2-3° C. The samples were then vacuumed and stored in -18°C until analysis. Collagen determination of the LT samples were carried out according to the procedures reported by Listrat *et al*., (2001). Hydroxyproline content was determined according to the procedures of Woessner, (1961) and optical densities were read at 557 nm. For amino acids determination, four different conditions of protein hydrolysis have been applied. Three acidic hydrolysis (HCL 6N, 110°C) : 24 h, 24 h after performic oxidation for the sulphur amino acids, and 48 h for branched chained amino acids. One basic hydrolysis ($Ba(OH)_2$, 4N, 110°C, 16 h) for tryptophan determination was carried out. Total lipids were extracted according to the method of Folch *et al*., (1957). Fatty acid analysis was achieved by gas–liquid chromatography (GLC) using the Perichrom 2000 chromatograph (Perichrom, Saulx-les-Chartreux, France) fitted with the CP-Sil 88 glass capillary column (length: 100 m, i.d.: 0.25 mm) with H_2 as the carrier gas.

Data was analyzed using student-*t* test to determine significances of difference in the studied parameters (carcass weight, collagen content, amino acids and fatty acids) between male and females. Multiple means were separated by Least Significant Differences (LSD) where appropriate and differences were considered significant at $P \leq 0.05$.

Results and Discussion

Insoluble OH proline (2.5 and 2.4) µg/ DM and total OH proline (3.5 and 3.3) µg/ DM, which estimate insoluble and total collagen contents, were found to be similar in male and female LD muscles. Babiker and Yousif, (1990) reported 2.37% for OH proline solubility in camel LD muscle which was lower than that for males (26 %) in the present study. This may be explained by different analytical methods. In bovine, Stolowski *et al*., (2006) reported high values of insoluble and total collagen compared to our results. However, strong correlations between insoluble collagen content and raw Warner– Bratzler peak shear force values were reported in bovine by Riley *et al*., (2005) and Stolowski *et al*., (2006).

Amino acid analysis in camel LD muscle showed that leucine, lysine and argnine were the most abundant essential amino acids (1937, 1868, and 1440 mg/ 100g muscle for males and 2010, 1909, and 1604 mg/ 100g muscle for females, respectively). Glutamic acid, aspartic acid, alanine and

proline were the highest non essential amino acids (4268, 2298, 1330 and 1164 for males and 4251, 2246, 1347 and 1074 for the female camel muscles). This is in contrast with the results of Kadim *et al*., (2011) who reported that lysine was the major essential amino acid in male camel LT muscle. The concentration of amino acids in the present study was higher than that reported by Dawood and Alkanhal, (1995), Kadim *et al*., (2008) for male muscles. These differences could be attributed to age or breed differences. Females showed high values of amino acids, but they were not significantly different from males. No differences were observed between sexes for total SFA (48.2 and 51.4% in males and females, respectively), total MUFA (36.9 and 35.1%) and PUFA (13.6 and 12.3%) proportions. The study revealed significant differences between male and female camels for some specific MUFA: 18:1 delta 10-11 *trans*, x1.51, (*P=0.05*), CLA *trans*11, *cis* 9 18:2, x1.33% (*P=0.11*) and *trans*10, *cis* 12 18:2, × 5.7, *(P=0.03)* in muscles from females compared to males. The PUFA/SFA ratio was higher than that of beef (0.5 *vs.* 0.1-0.15) and close to the recommended value for human nutrition (0.45). As in grass-fed bovines, the n-6/n-3 ratio in camel meat is lower (around 3) than that of concentrate-fed bovines (more than 7), and thus lower than the recommended values of human health diets (4.0).

References

Dawood, A. A., & Alkanhal, M. A. (1995). Nutrient composition of Najdi-camel meat. *Meat Science*, 39: 71–78.

Elgasim, E. A., & Alkanhal, M. A. (1992). Proximate composition, amino acids and inorganic mineral content of Arabian camel meat: Comparative study. *Food Chemistry*, 45: 1–4.

Kadim, I.T., Al-Ani, M.R., Al-Maqbaly,R.S., Mansour, M.H., Mahgoub, O. and Johnson, E.H. (2011). Proximate, amino acid, fatty acid and mineral composition of raw and cooked camel (*Camelus dromedarius*). *British Food Journal*, 113 (4): 482-494.

Kadim, I.T., Mahgoub, O. and Purchas, R.W. (2008). A review of the growth, and of the carcass and meat quality characteristics of the one-humped camel (*Camelus dromedaries*). *Meat Science*, 80: 555-569.

Kurtu, M. Y. (2004). An assessment of the productivity for meat and carcass yield of camel (*Camelus dromedarious*) and the consumption o f camel meat in the Eastern region of Ethiopia. *Tropical Animal Health and Production*, 36: 65–76.

Listrat, A., Picard, B., Jailler, R., Collignon, H., Pecatte, J.R., Micol, D., Geay, Y and Dozias, D. (2001). Grass valorization and muscular characteristics of blonde d' Aquitaine steers. *Animal Research*, 50: 105-118.

Polidori, P., Renieri, C., Antonini, M., Passamonti, P. and Pucciarelli, F. (2007). Meat fatty acid composition of llama (Lama glama) reared in the Andean highlands. *Meat Science*, 75: 356–358.

Riley, D.G., Johnson, D.D.**,** Chase, C.C.J., West, R.L., Coleman, S.W. and Olson, T.A. (2005). Factors influencing tenderness in steaks from Brahman cattle. *Meat Science*, 70: 347–356.

Stolowski, G.D., Baird, B.E., Miller, R.K., Savell, J.W., Sams, A.R., Taylor, J.F. (2006). Factors influencing the variation in tenderness o f seven major beef muscles from three Angus and Brahman breed crosses. *Meat Science*, 73: 475−483.

Woessner, J. F. (1961). The determination of collagen in tissue and protein samples containing small proportions of amino acid. Archives o f Biochemistry and Biophysics, 93, 440–448.

Yousif, O. Kh. and Babiker, S.A. (1989). The desert camel as a meat animal. *Meat Science*, 26, (4): 245-254.